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Spiraling Arrangement

The invention relates to a spiraling arrangement for applying a spirally-shaped filament layer onto an elongated carrier which is advanceable in the direction of the carrier longitudinal axis. The spiraling arrangement has a rotor and a plurality of filament bobbin carrier shafts which are distributed on a circumscribed circle of the rotor and are each configured to take up a plurality of filament bobbins. The rotor is rotatable about the longitudinal axis and the filament bobbin carrier shafts extend in the direction of the carrier longitudinal axis.

Dense filament layers are spiraled onto a plastic or rubber carrier by at least one spiraling arrangement especially for reinforcing rubber or plastic hoses or tubes with reinforcement layers. One such manufacturing method is, for example, described in German utility model 1928 736 and in DE 38 24 757 A1. Here, filaments are pulled off from a plurality of filament bobbins and are guided through bores onto an extruded plastic hose. The filament bobbins are arranged on the periphery of a circularly-shaped bobbin carrier and the bores are arranged radially in the bobbin carrier. The bobbin carrier rotates so that a spirally-shaped filament layer is applied to the plastic hose which is advanced along the rotational axis. A further spiraling arrangement is mounted behind the first spiraling arrangement and rotates in the opposite direction so that a further opposing filament layer is formed.

A further plastic layer is applied to these two filament layers with a further extruder.

The limited number of bores, which are present on the periphery of the spiraling arrangement, is disadvantageous. The

number of filaments, which can be spiraled-on per spiraling arrangement, is limited and therefore also the density of the filament layer. The number of bores cannot be increased as desired.

In EP 0 605 767 A1, an improved spiraling arrangement is disclosed wherein a plurality of bobbins are arranged on several circumscribed circle radii of a plate. The filament bobbins are accommodated by filament bobbin carrier shafts which are configured for each taking up three bobbins one next to the other. The filaments of the filament bobbins are pulled off radially inwardly and are guided through filament guide struts with through-guiding bores into an extrusion head.

It is disadvantageous that the individual filament bobbins with the corresponding filaments are only accessible with difficulty so that the preparation time and the required preparation complexity are relatively great. In addition, a uniform filament tension of all filaments is not ensured to an adequate extent.

The object of the invention is therefore to provide an improved spiraling arrangement wherein the above disadvantages are avoided or reduced.

The object is achieved with the spiraling arrangement in accordance with the invention in that filament brake elements are distributed over the periphery at one end face of the rotor and are drivable synchronously with respect to each other. The filaments are taken off the bobbin coils preferably tangentially and are guided onto the carrier with filament guide elements via the filament brake elements and an annular comb which encloses the carrier.

With the arrangement of the filament brake elements and the

annular comb at one end face of the rotor and with the filament bobbin carrier shafts at the periphery of the rotor, it can be ensured that the filaments, which are taken off the filament bobbins, can be guided in the same way with virtually the same deflecting angles and be charged with the same filament tension. In this way, it is ensured that the filament tension of a filament over time and the filament tensions of the filaments with respect to each other are uniform. With the tangential pull off of the filaments from the filament bobbins, it is additionally prevented that (as in overhead pull off) the filaments become tangled with each other when being pulled off and possibly form loops when loosening which could lead to a break of the filament thereby affecting the product in a negative manner.

With the arrangement of the spiraling arrangement of the invention, all filament bobbins and filaments are easily accessible and viewable so that the preparation of the spiraling arrangement and the monitoring are optimized.

The filament brake elements are preferably configured as cylindrically-shaped rotatable drums, so-called shaft feed wheel units, which have several filament take-up slots. The filament take-up slots extend each over the periphery of the drum and are spaced from each other in the direction of the longitudinal axis of the drum. In each case, one filament is wrapped multiple times about a filament take-up slot. In this way, all filaments, which are coupled to a filament brake element, are braked to the same extent and a uniform filament tension is ensured.

Each filament brake element can have its own drive/brake unit. Alternatively, several filament brake elements can, however, be coupled to each other, for example, via gear

assemblies, chains or belts and can be driven together or braked in order to increase or decrease the filament tension.

Also, brake elements can be integrated into the bearings of the filament bobbins to generate the filament tension.

It is especially advantageous when the rotor is made up of separate circular segments and the filament brake elements of one particular circular segment are coupled to each other. In this way, the manufacture and maintenance of the rotor is simplified.

In order to ensure a uniform filament tension for all filaments, it is preferable to provide a central control unit for the filament brake elements with which the drive/brake units are so controlled that a uniform adjustment of the filament tensions of all filaments is ensured.

The filament guide elements, which are provided for deflecting the filaments at an angle of more than 30°, are preferably configured as deflecting rollers. In this way, it is ensured that the filament tension is affected as little as possible by the filament deflection.

The filament bobbin carrier shafts are preferably releaseably supported between the two end faces of the rotor spaced from each other. In this way, the filament bobbins can be easily exchanged and the preparation time for the spiraling arrangement can be further reduced.

The annular comb has a through-guide bore for the carrier at the center of the annular comb and a plurality of slits for taking up respective filaments. The slits extend radially from the outer periphery. In contrast to conventional bores for the through guidance of the filaments, the slits have the advantage that a plurality of filaments can be guided separately from each other on a relatively small periphery. In addition, the

filaments can be easily placed in the slits and need not be threaded through the bores with difficulty.

In the annular comb, an inner sleeve is centrally arranged which tightly encloses the carrier. The inner edge of the inner sleeve, which adjoins the carrier at the inlet end, is radially so beveled that the filaments are guided from the slits in the annular comb over the radial bevel directly onto the carrier.

The invention will be explained in greater detail below with respect to the attached drawing.

FIG. 1 shows a cross section view of the spiraling arrangement of the invention.

FIG. 1 shows a cross section of the spiraling arrangement 1. A carrier 2 (for example, cylindrical tubes arranged one behind the other) with at least one rubber layer, which is extruded on the tube, is guided through the center of the spiraling arrangement in the carrier longitudinal axis X of the carrier 2 and advanced. The spiraling arrangement 1 has a rotor 3, which is driven by a drive unit 4, and rotates about the longitudinal axis of the carrier 2. A plurality of filament bobbin carrier shafts 5 are distributed in at least one circumscribed circle radius of the rotor 3. The filament bobbin carrier shafts 5 extend between a first end face 6a and the second end face 6b of the rotor 3 and are supported preferably releasably in clamp holders. Each filament bobbin carrier shaft 5 is configured for accommodating a plurality of filament bobbins 7 which are rotatably journalled on the filament bobbin carrier shaft 5 in the direction of the carrier longitudinal axis X. The shafts of the filament bobbins extend likewise in the direction of the carrier longitudinal axis X.

The filaments 8, which are wound on the filament bobbins 7,

are pulled off tangentially from the filament spools 7 and are guided by filament guide elements 9 to the first end face 6a of the rotor 3. A plurality of filament brake elements 10 are distributed about the periphery at the first end face 6a of the rotor 3. The filament brake elements 10 are coupled to at least one drive/brake unit 11 in such a manner that the filaments 8 can be influenced uniformly with respect to filament tension. For this purpose, the filament brake elements 10 are configured as cylindrically-shaped rotatable drums having several filament take-up slots which extend each over the periphery of the drum and are spaced from each other in the direction of the longitudinal axis of the drum. Each one filament 8 is wound several times about a filament take-up slot and is taken up by this slot. Several filament brake elements 10 are coupled to each other via a belt drive, chain drive or gear assembly drive and are driven or braked by a common drive/brake unit. The at least one drive/brake unit 11 is so controlled by a control unit that all filament brake elements 10 of the spiraling arrangement are synchronized to each other and a uniform filament tension is ensured.

The filaments are guided from the filament brake elements 10 radially inwardly to an annular comb 12. The annular comb 12 has a through-guided bore for the carrier in the center of the annular comb 12 as well as a plurality of slits for taking up respective ones of the filaments. The slits extend radially from the outer periphery of the comb ring 12. In the comb ring 12, an inner sleeve 13 is arranged which encloses the carrier 2. The inner edge of the inner sleeve 13 borders on the carrier at the take-in end and is radially beveled so that the filaments 8 can be guided through the slits over the radial bevel directly onto

the carrier 2.